(12) AUSTRALIAN PATENT ABSTRACT
(19) AU

(11) AU-A-41984/85

(54) SAFETY SEAL

(71) EKATO INDUSTRIEANLAGEN VERWALTUNGSGESELLSCHAFT MBH AND CO.

(21) 41984/85 (22) 6.5.85 (24) 6.5.85

(43) 13.11.86

(51)4 F16J 15/26 F16J 15/32 F16J 15/46

(72) WALTER GENG, DETLEF KLATT AND HANS SCHUPPER

(74) SF

(57) Claim

1. Safety seal, especially for sealing the passage of the shaft of an agitator vessel through the wall of the latter, especially to protect the main seal of the agitator vessel, characterised in that a fixed sealing ring which is inserted into the wall of the agitator vessel and a rotating sealing ring which sits on the shaft are arranged in the area of the passage of the shaft through the wall of the agitator vessel.

2. Safety seal according to Claim 1, characterised in that the rotating sealing ring is acted upon continually by a spring in the axial direction and pressed against the fixed sealing ring.

3. Safety seal according to Claim 1 or 2, characterised in that a flushing agent is fed into an annular gap between the fixed sealing ring and the shaft, by means of which flushing agent the rotating sealing ring is pressed axially against the force of th spring and is axially lifted from the fixed sealing ring.

FORM 10 SPRUSON & FERGUSON

COMMONWEALTH OF AUSTRALIA
PATENTS ACT 1952

COMPLETE SPECIFICATION

(ORIGINAL)
FOR OFFICE USE:

Class Int. Class
41984/85

Complete Specification Lodged:
Accepted:
Published:
Priority:
Related Art:

Name of Applicant: EKATO INDUSTRIEANLAGEN VERWALTUNGSGESELLSCHAFT MBH & CO.

Address of Applicant: Kappelemattweg 2, D-7860 Schopfheim, Federal Republic of Germany

Actual Inventor(s): WALTER GENG, DETLEF KLATT and HANS SCHUPPER

Address for Service: Spruson & Ferguson, Patent Attorneys, Level 33 St Martins Tower, 31 Market Street, Sydney, New South Wales, 2000, Australia

Complete Specification for the invention entitled:

"SAFETY SEAL"

The following statement is a full description of this invention, including the best method of performing it known to us

SBR:ep 51M

Abstract

The invention relates to a safety seal, especially for sealing the shaft of agitator vessels. The safety seal, which consists of two sealing rings, is used for protecting the main seal, especially when work is being carried out with an aggressive or abrasive agitated material. Moreover, it also makes it possible to seal the agitator vessel against the escape of the agitated material when the main seal is being dismantled. Finally, the safety seal itself can be replaced with the agitator vessel completely sealed.

Description

The invention relates to a safety seal, especially for sealing the passage of the shaft of an agitator vessel through the wall of the latter, especially to protect the main seal of the agitator vessel.

Agitator vessels are used in many fields of technology, especially in chemical process technology for mixing and agitating product of all types.

In agitator vessels with a horizontal shaft, this shaft, which carries the agitator member, is guided through a side wall of the vessel, it being necessary to provide suitable seals between the wall and agitator shaft to prevent the agitated material from escaping out of the vessel. Suitable seals for this purpose are, for example, mechanical face seals.

The disadvantage of such seals is that the agitator equipment has to be stopped when these seals are dismantled and installed, and especially when damaged seals are replaced. It has also been shown that the seals can be damaged when aggressive or abrasive media are being agitated.

The object of the invention is therefore to create a safety seal of the abovementioned type, by means of which the main seal is protected against the penetration of the agitated material.

According to the invention, this is achieved in that a static sealing ring which is inserted into the wall of the agitator vessel and a rotating sealing ring which sits on the shaft are arranged in the area of the passage of the shaft through the wall of the agitator vessel.

In this connection, the rotating sealing ring is expediently acted upon continually by a spring in the axial direction and pressed against the static seal fixed to the wall.

A flushing agent is preferably fed into an annular gap between the static seal fixed to the wall and the shaft, by means of which flushing agent the rotating sealing ring is pressed axially against the force of the spring and is axially lifted from the static seal fixed to the wall.

In this way, the main seal is protected against penetration of the agitated product.

If it is necessary to replace the main seal, the safety seal assumes the function of a shutdown seal which prevents the agitated material from escaping to the outside.

When the main seal is dismantled, the shaft, by means of a clamping ring placed on top of it, is advantageously connected to the static seal fixed to the wall and is thus held in its position.

For dismantling the safety seal, a sealing disc is preferably provided which sits on the shaft and can be pressed against a seal on the inside of the wall of the agatator vessel.

In this way, the vessel is tightly sealed to the outside if the safety seal itself has to be dismantled and replaced as a result of damage or waste.

An auxiliary seal housing is advantageously arranged on the outside of the wall of the agitator vessel, which auxiliary seal housing collects agitated material which has escaped to the outside during the dismantling of the safety seal.

The sealing disc can be screwed into the wall of the agitator vessel by turning the shaft.

The sealing disc is advantageously provided with wedge surfaces which run in the peripheral direction and behind which retaining pins, which are attached to the inside of the wall of the agitator vessel, engage in such a way that the sealing disc is drawn axially towards the wall by turning the shaft.

Moreover, the sealing disc is expediently provided with a radial collar on which the wedge surfaces are formed on the side facing away from the retaining pins.

The retaining pins preferably have a head of larger diameter and a neck of smaller diameter, and the collar also has through holes for the heads of the retaining pins as well as slotted holes adjoining the through holes in the peripheral direction, the width of which slotted holes is slightly larger than the diameter of the neck of the retaining pins.

By turning the sealing disc relative to the retaining pins, the sealing disc, as a result of the wedge surfaces arranged on its collar, is thus pressed axially against the inner wall.

Illustrative embodiments of the invention are described below with reference to the drawing, wherein:

Figure 1 shows a schematic sectional view of a first embodiment of a safety seal.

Figure 2a shows a safety seal according to Figure 1 on dismantling the main seal.

Figure 2b shows the dismantling of the safety seal itself.

Figure 3a shows a further embodiment of the safety seal.

Figure 3b shows the safety seal according to Figure 3a in the position in which it can be replaced.

Figures 4 and 5 show a plan view and a side view respectively of a detail of the sealing disc.

Figure 1 shows a section of part of a wall 10 of an agitator vessel (not shown in detail), through which a shaft 12 extends to the outside. The shaft 12, which carries agitator members (not shown) for agitating the contents of the agitator vessel, runs horizontally and is also suitably mounted and driven, although this is not shown. A main seal 14 is arranged on the outside of the wall 10, which main seal 14 is designed in the form of a mechanical face seal and is used to prevent the agitated material from escaping to the outside from the inside of the vessel.

The main seal 14 is known and is therefore not described in detail. The main seal 14 is arranged in a seal housing 20 which is fixed to the wall 10 by screws 22. A plate 16 is installed between the seal housing 20 and the wall 10. A threaded ring 24 is inserted into the wall 10 and is connected to the wall by, for example, a welded joint. A sealing ring 26 is screwed into the threaded ring 24, which sealing ring 26 has a collar 28 which, in the installed condition, sits as shown on the outer end face of the threaded ring 24. A seal 18, for example in the form of an O-ring, is arranged between the outer end face of the sealing ring 26 and the plate 16. Moreover, a seal in the form of an O-ring 30 is inserted into a groove in the cylindrical surface of the sealing ring 26, which O-ring 30 assumes the sealing function between the sealing ring 26 and the threaded ring 24.

Located axially inwards from the static sealing ring 26 fixed to the wall, a rotating sealing ring 32 sits on the shaft 12 and is provided on its inner cylindrical surface with a groove into which is inserted a seal in the form of an O-ring 34 which seals relative to the shaft 12. A spring 36, for example a

helical spring, attempts to continually press the rotating sealing ring 32 against the inner end face of the fixed sealing ring 26. The spring 36 is supported on a sealing disc 38 which is provided with an outside screw thread and is firmly connected to the shaft 12, for example by welding.

The safety seal according to Figure 1 works as follows. As already mentioned, the main seal 14 seals the agitator vessel to the outside. The safety seal, which essentially consists of the two sealing rings 26 and 32, is used among other things to protect the main seal against the penetration of aggressive or abrasive agitated material.

For this purpose, a flushing agent is fed in during operation via a hole 76 made in the plate 16, which flushing agent is neutral relative to the agitated material. From the hole 76, this flushing agent enters into an annular gap 78 between the shaft 12 and the fixed sealing ring 26. Because of the pressure of the flushing agent, the rotating sealing ring 32 is lifted from the static sealing ring 26 against the force of the spring 36, so that a gap develops between the two sealing rings, through which gap the flushing agent flows into the inside of the vessel and prevents the product located in the vessel from flowing back towards the main seal 14. The flushing agent is prevented from escaping to the outside by the main seal 14, the O-ring 18 and the O-rings, which are also shown in Figure 1 but not described in detail, between the seal housing 20 and the main seal 14.

If the supply of the flushing agent fails during operation, the sealing ring 32 is pressed by the spring 36 against the sealing ring 26. The two sealing rings, at least in the area of their superimposed end faces, have emergency running properties, so that, at least for a limited period of time, a sealing effect is achieved between the two superimposed end faces of the two sealing rings 32 and 26. Otherwise, the agitator vessel is sealed to the outside by the O-rings 34 and 30. The two seals 26 and 32 can be made, for example, from tungsten carbide.

Figure 2a shows the replacement of the main seal 14. Previously, it was necessary to stop the agitator equipment for a prolonged period and to empty the agitator vessel if the mechanical face seal 14 had to be replaced. This can now be avoided by

the safety seal, which, when the seal 14 is dismantled and replaced, assumes the function of a shutdown seal by means of which the agitated product is prevented from escaping to the outside.

To replace the main seal 14, the screws 22 are slackened and then the seal housing 20, together with the plate 16, is raised and dismantled.

A clamping ring 42 is placed onto the shaft 12 and secured in clamped manner with the latter, which clamping ring 42 has a collar 44 which has at least one through hole for a screw 46. By means of this screw 46, the clamping ring 42 is connected to the sealing ring 26, which has a corresponding tapped hole 82 in its collar 28. The shaft 12 is fixed in its position by the clamping ring 42, so that the outer bearing (not shown in the drawing) can be dismantled and the main seal 14 can be removed from the shaft. The agitator vessel is sealed against an escape of the agitated material to the outside by the O-rings 30 and 34. Also, because the sealing ring 32 is pressed by the spring 36 against the sealing ring 26, the end faces, which face one another, of the two sealing rings sit tightly on one another and thus prevent the agitated material from penetrating along these end faces.

Figure 2b shows the dismantling of the safety seal itself. If it is necessary to replace the safety seal, for example because of wear, the main seal 14, as described above, is first dismantled and the clamping ring 42 is attached. An auxiliary seal housing 48 is fixed to the outside of the wall 10 by screws 50 after the main seal 14 has been dismantled. A seal, for example in the form of an O-ring 56, is arranged between the auxiliary seal housing 48 and the wall 10. The auxiliary seal housing 48 has a bearing part 52 in which the shaft 12 is mounted and guided. A seal in the form of an O-ring 54 is installed between the shaft 12 and the bearing part 52.

The shaft 12 is now turned, by which means the sealing ring 26, which is connected to the shaft 12 by the screw 46 and the clamping ring 42, is screwed out of the threaded ring 24. During this procedure, the shaft 12, apart from turning, also moves axially. When the sealing ring 26 has been screwed completely out of the threaded ring 24, the shaft 12 is axially displaced until the sealing disc 38 butts against the threaded ring 24, whereupon the

sealing disc 38 is screwed into the threaded ring 24 by further turning of the shaft 12 until the collar 40 of the sealing disc 38 comes in contact with a seal, for example designed in the form of an O-ring 58, which is arranged in a groove in the inner end wall of the threaded ring 24. The O-ring 58 thus assumes the sealing function to the outside, as shown by Figure 2b.

Any leakage which occurs when the sealing ring 26 is screwed out of the threaded ring 24 is caught in the auxiliary seal housing 48 and drawn off via an outlet 80. As already mentioned, the auxiliary seal housing is sealed by the O-rings 54 and 56.

As soon as the sealing disc 38 has been screwed fully into the threaded ring 24 and thus effects a seal, the auxiliary seal housing 48 can be dismantled and the sealing rings 26 and 32, together with their O-rings 30 and 34 and also the spring 36, can be replaced.

The opposite procedure is used when installing the main seal 14 or the safety seal 26 and 32.

Figures 3a and 3b show a modified embodiment of the safety seal. Figure 3a shows the normal operating condition, the main seal not being shown for reasons of simplicity.

The functional mode during operation is the same as in the embodiment according to Figure 1; that is, the flushing agent is fed in via the hole (not shown in Figure 3a) in the plate 16, the pressure of which flushing agent lifts the sealing ring 34 axially from the sealing ring 26, so that the flushing agent flows into the inside of the agitator vessel through the gap between the two sealing rings 34 and 26 and the agitated material is prevented from escaping outwards to the main seal. Here, unlike in Figure 1, a retaining ring 62 is arranged in the wall 10 instead of the threaded ring 24, into which retaining ring 62 a sealing ring 26 is only pushed axially, since both the sealing ring 26 and the retaining ring 62 have no screw thread. In this embodiment, the sealing ring 26 is connected to the retaining ring 62 by a screw 60.

The main seal is dismantled practically in the same way as was described with reference to Figure 2a.

On the other hand, if the safety seal itself is to be

replaced, that is, the sealing rings 26 and 32 are to be replaced, the procedure is as follows.

At least two diametrically opposite retaining pins 64 are fixed to one retaining ring 62. The retaining pins 64 which have a threaded shank on one of their ends, are screwed into corresponding tapped holes in the inner end face of the retaining ring 62. They also have a head 66 and a neck 68, the diameter of the neck 68 being smaller than that of the head 66. Their centre axes run practically parallel to the centre axis of the shaft 12.

Here, the sealing disc 38 has a collar 84 which runs along its outer periphery, in which collar 84 through holes 70 are made which correspond to the heads 66 of the retaining rings 64. A slotted hole 72 adjoins each through hole 70 in the peripheral direction of the collar 84 and in both directions as viewed from the through hole 70, as shown in Figure 4. The width of the slotted holes 72 is slightly larger than the diameter of the neck 68 of the retaining pins 64.

On the underside, that is, on the side pointing inwards towards the agitator vessel, the collar 84 is provided with wedge surfaces 74, as shown in Figure 5, which run from the centre of the through hole 70 towards both sides and extend at least over the area of the slotted holes 72.

If the sealing rings 26 and 32 are now to be dismantled or replaced, the main seal and the plate 16, as described above, are first dismantled, whereupon the screw 60 is slackened. The shaft 12 is then moved axially outwards. The sealing ring 26 is pushed axially out of the retaining ring 62 by the sealing disc 38 via the spring 36 and the sealing ring 32, which sealing disc is firmly connected, expediently welded, to the shaft. During this movement, the heads 66 of the retaining pins 64 plunge into the through holes 70 of the sealing disc 38 and re-emerge from these holes, as shown in Figure 3b, until the collar 84 of the sealing disc 38 is located in the area of the neck 68 of the retaining pins 64, as Figure 3b also shows. For this purpose, the height of the collar 84 is smaller than the axial length of the neck 68. The shaft 12, and thus the sealing disc 38, are now turned, by which means the neck 68 of the retaining pins 64 enters into the respective slotted hole 72 (Fig.4) of the collar 84. Because the surface of the collar 84

facing the vessel is designed as a wedge surface 74, as shown in Figure 5, the sealing disc 38, at its end face 86, is pressed against the O-ring 58 by this turning of the sealing disc 38 relative to the retaining pins 64, which O-ring 58 sits in an annular groove in the inner end face of the retaining ring 62, as shown in Figure 3b.

This seals the inner space of the agitator vessel to the outside.

In this position, that is in the position in which the agitator vessel has already been completely sealed to the outside by the sealing disc 38 and the O-ring 58, the O-ring 30 of the sealing ring 26 has still not left the hole of the retaining ring 62, so that no agitated material can escape to the outside during this procedure, which is why the auxiliary seal housing described with reference to Figure 2b can be dispensed with.

As soon as the sealing disc 38 has been pressed against the O-ring 58 and there is a full sealing effect, the sealing rings 26 and 32 can be removed from the retaining ring 62 and replaced.

~~Patent Claims~~

The claims defining the invention are as follows:

1. Safety seal, especially for sealing the passage of the shaft of an agitator vessel through the wall of the latter, especially to protect the main seal of the agitator vessel, characterised in that a fixed sealing ring which is inserted into the wall of the agitator vessel and a rotating sealing ring which sits on the shaft are arranged in the area of the passage of the shaft through the wall of the agitator vessel.

2. Safety seal according to Claim 1, characterised in that the rotating sealing ring is acted upon continually by a spring in the axial direction and pressed against the fixed sealing ring.

3. Safety seal according to Claim 1 or 2, characterised in that a flushing agent is fed into an annular gap between the fixed sealing ring and the shaft, by means of which flushing agent the rotating sealing ring is pressed axially against the force of the spring and is axially lifted from the fixed sealing ring.

4. Safety seal according to one of the preceding claims, characterised in that, when the main seal is dismantled, the shaft, by means of a clamping ring placed on top of it, can be connected to the fixed seal and is thus held in its position.

5. Safety seal according to one of the preceding claims, characterised in that a sealing disc is arranged on the shaft axially inwards from the rotating sealing ring, which sealing disc can be pressed in a tightly sealed manner against the inside of the wall of the agitator vessel when the safety seal is dismantled.

6. Safety seal according to Claim 5, characterised in that an auxiliary seal housing is arranged on the outside of the wall of the agitator vessel, which auxiliary seal housing collects agitated material which has escaped to the outside during the dismantling of the safety seal.

7. Safety seal according to Claim 5, characterised in that the sealing disc can be screwed into the wall of the agitator vessel by turning the shaft.

8. Safety seal according to Claim 5, characterised in that the sealing disc is provided with wedge surfaces which run in the peripheral direction and behind which retaining pins, which are

attached to the inside of the wall, engage in such a way that the sealing disc can be pressed axially against the wall when the shaft is turned.

9. Safety seal according to Claim 8, characterised in that the sealing disc is provided with a radial collar on which the wedge surfaces are formed on the side facing away from the retaining pins.

10. Safety seal according to Claim 8, characterised in that the retaining pins have a head and a neck, and also in that the collar has through holes for the heads of the retaining pins as well as slotted holes adjoining the through holes in the peripheral direction, the width of which slotted holes is slightly larger than the diameter of the neck of the retaining pins.

DATED this SIXTH day of MAY 1985

EKATO INDUSTRIEANLAGEN VERWALTUNGSGESELLSCHAFT MBH & CO.

Patent Attorneys for the Applicant
SPRUSON & FERGUSON

Fig. 1

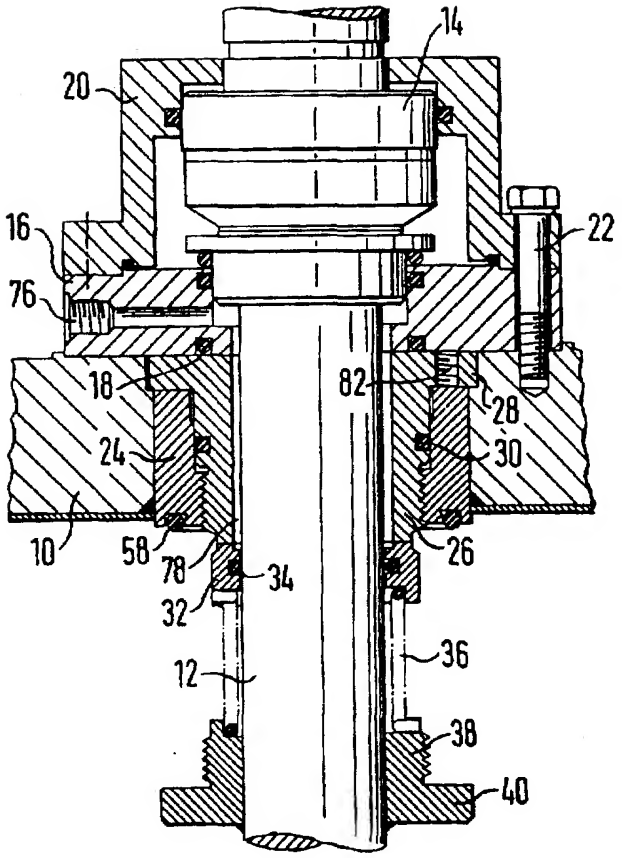

Fig. 2b Fig. 2a

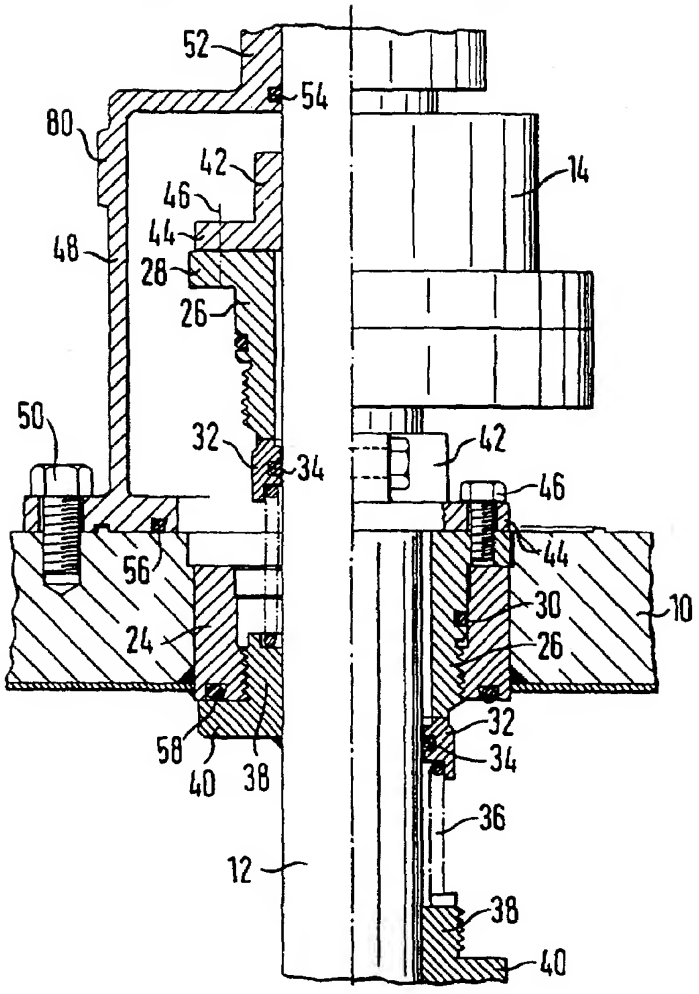
52
54
80
42
46
44
48
28
26
50
32
34
42
46
44
56
30
10
24
26
32
58
34
40
38
36
12
38
40

Fig. 3b

Fig. 3a

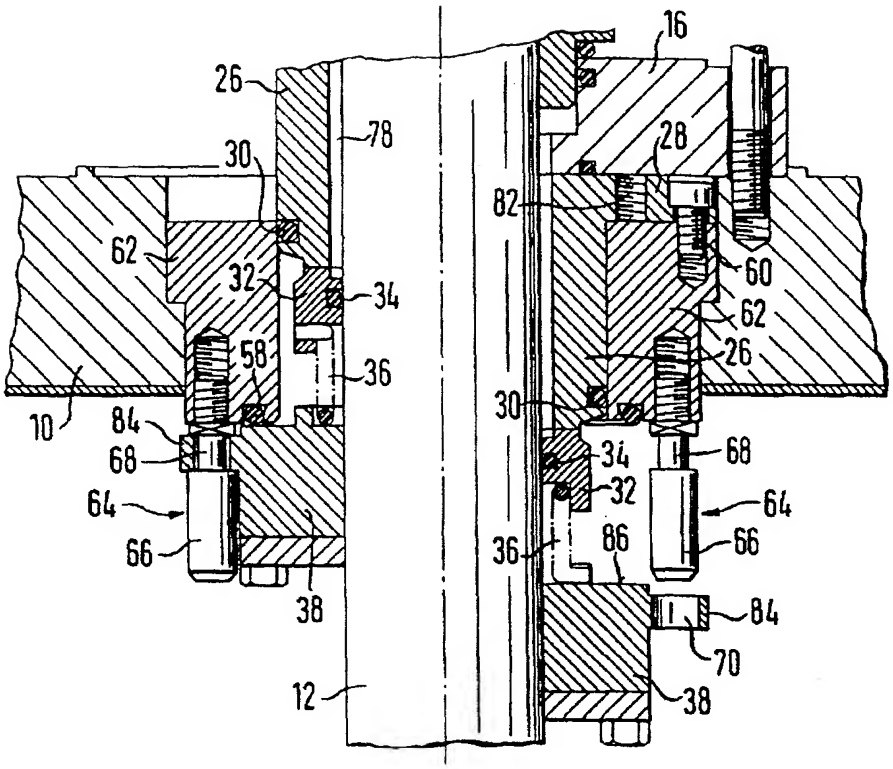

Fig. 4

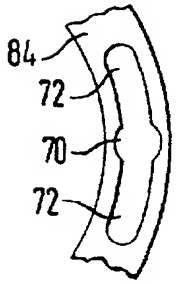

Fig. 5